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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/572,893	03/20/2006	Fufang Zha	2003P87075WOUS	2949

28524 7590 06/03/2010

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ART UNIT	PAPER NUMBER
1797	

MAIL DATE	DELIVERY MODE
06/03/2010	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/572,893
Filing Date: March 20, 2006
Appellant(s): ZHA ET AL.

Gregory K. Gerstenzang
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 4/26/10 appealing from the Office action mailed 12/17/09.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 1, 4-11 and 24-28 are pending as rejected, which are presented in the claims list of 11/12/2009. Claims 1,4 and 10 are independent.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being

maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

US 5,403,479	SMITH	4-1995
US 5,209,852	SUNAOKA	5-1993
US 2001/0052494	COTE	12-2001
US 5,643,455	KOPP	7-1997
JP 11-076769	NOBYYUKI	3-1999
US 2003/0150807	BARTELS	8-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422

F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 4-11 and 24-28 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the pending process claims of copending Application Numbers as shown below. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application claims the limitations claimed in these reference applications.

11/179,391: Claims 1-4,6,7,9-11,13-19

11/316,593: Claims 1-18,20-25,30

11/574,819: Claims 1-10

11/912,859: Claims 1-25

10/569,565: Claims 15-40

10/572,971: Claims 1-11.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Regarding the applicant's statement that a terminal disclaimer would be filed once the claims are otherwise found allowable, please note that the double-patenting rejection cannot be removed until a terminal disclaimer is filed.

Claim Rejections - 35 USC § 103

1. Claims 1, 4-11 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Smith (US 5,403,479), Sunaoka et al (5,209,852), Kopp et al (US 5,643,455), Cote et al (US 2001/0052494).and/or JP 11076769.

Smith teaches filtering using submerged membranes in a tank and backwashing the membrane as claimed under low pressure and pulsed flow with, among other options, permeate liquid – see column 11, lines 20-61 and the figures. Pressure applied is below the bubble point (line 30 at column 11). Smith in example (4) (fig. 4) shows permeate as the backwash fluid. Smith also teaches using a gas for the back flush – C12, L19-25, in which case there will be residual permeate in the hollow fiber lumen as well as the header and piping when the permeate side is isolated (which requires operation of a valve; such steps are implied when Smith teaches using a gas to back-flush) to admit the gas, which would read on, or at least make obvious, the claims as amended. Smith also teaches that back-flushing using low pressure gas is well known in the art and discusses the pros and cons of this process – see C7, line 66 - C8, L47; particularly C8, L39-47. **Lines 39-47 of column 8 teach that hydraulic back flushing by permeate using low pressure gas is well known in the art.**

Smith also teaches bubbling air on the external surface of the membrane (fig 2, C17, L7-31). Isolating the membrane from the filtrate collection area is implied when the reference teaches introducing a gas or cleaning chemical into the lumen. This is also not a critical step in the process, because appellant in claim 11 has "increasing the

amount of permeate available for backwashing …by further providing a … reservoir in the permeate flow circuit", which means that the gas supply line can be anywhere downstream in the permeate collection segment of the plant.

It may be noted that when gas pressure is below bubble point, inherently the gas will not penetrate the pores of the membrane, but would stay only in the lumen of the membrane. By definition, bubble point is the pressure at which gas breaks through the pores of the membrane.

Smith also teaches that the drawback of gas pressurization process is that it places great strain on the membrane (column 8, lines 23-25)

What Smith does not teach is pressurizing the membrane from both ends. However, Smith does teach that the dead-end backwashing is known (C8, L39-47). Thus, providing the gas pressure from both ends of the membrane would be obvious to one of ordinary skill in the art, and is not a patentable process step. Also the specific details of the lines and manifolds to be included in the backwash is also not patentable – these are only details of implementing the process step in to a specific system, which would be within he skill of one of ordinary skill. Knowing the principle of a process step, implementing it to a specific apparatus would be only routine engineering, and within the skill of one of ordinary skill.

Sunaoka teaches in column 1, under "Prior Art" (line 14), scouring the membrane (scrubbing) with gas bubbles, backwash with wash water before, during or after scouring, and drain down (column 1, lines 45-49). Sunaoka teaches draining by

charging compressed air - see column 6, lines 63-68. Sunaoka teaches in column 8, line 63 - column 9, line 21, blow down of the wastewater from the tank using water head or compressed air, as well as secondary washing after the blow-down. Sunaoka also teaches using compressed air to effect backwash – see column 10, lines 58-64. Also, using compressed air to effect pumping of liquids, and particularly, for backwashing filters and membranes is well known in the art.

The wash water in the teaching of Sunaoka could very well be permeate water, and use of permeate water as wash water is well known as is taught in Smith and other references cited herein. What Sunaoka does not teach is having a gas pressure below the bubble point as the driving force for the wass water, and pressurizing from both ends of the membrane. However, such details are well known, and of routine engineering for one of ordinary skill in the art, and is taught in several of the cited references herein.

Kopp teaches using air in the lumen of the hollow fibers at below the bubble point to flush water from the lumen and then above the bubble point to have effective air back-flush, while agitating the membrane. Kopp, C3, L27 – C4, L50. Scouring with external gas – see C4, L10-13. Kopp also contemplates the various steps recited in the dependant claims, such as reducing the volume of the liquid suspension, etc. Kopp also teaches delaying the onset of filtration process until the expanded membrane is relaxed to its normal condition after the back wash with air bubbles through the lumen (to prevent quicker plugging of the expanded fiber pores as they relax), which suggests

using Smith's teaching to modify Kopp, so that the backwashing is done only at a pressure as taught by Smith. Agitation of the membrane by scouring gas is taught by Cote, and is well known in the art.

Cote teaches back-washing and back-pulsing the membrane while scouring the membrane externally with air bubbles, which is conducted before or during draining the tank – see under the heading: "Chemical Cleaning with Tank Drained or Draining". The chemical cleaning agent can be a gas. Scouring the membrane with gas bubbles to keep the surface clean as well as agitate the fluid is also well known in the art, and is not an inventive process step. **Cote Fig 1 and corresponding disclosure (paragraph 0025) shows that the backwash is applied through both ends of the hollow fibers.**

It would be obvious to one of ordinary skill in the art to use the teachings of Kopp and/or Smith and/or JP (described below) in the teaching of Cote to improve the cleaning process of Cote, particularly, by removing the permeate in the lumen by gas pressure below the bubble point, as suggested by Smith to protect the membrane from damage due to strain (see Smith, column 8, lines 23-25).

JP-11076769 also teaches backwashing wherein the gas pressure is below the bubble point – see JP translation provided herewith, in an 892.

JP's teaching is similar to that of Smith. Paragraph 0012: gas pressure is below bubble point, particularly because gas pressure above this may damage the membrane. Gas pressure is applied before or after applying cleaning chemical, or both times. It

also teaches that it is desirable to apply gas prior to applying cleaning chemical to further enhance cleaning efficiency. Paragraph 0013 teaches that it is not necessary for the gas to permeate the filter membrane and reach the stock solution. Also, inherently, the gas would not penetrate the membrane pores because it is at bellow the bubble point.

Now, since the lumen and the manifold or header and the related piping of the permeate side of the membrane is filled with permeate before the cleaning step is begun, applying air at below the bubble point would make this permeate flow through the membrane pores back into the feed side.

Since applicant's claims are open-ended, any additional step of applying cleaning solution would not disqualify the reference.

JP does not teach scouring the surfaces of the membrane and backwashing from both ends. Scouring the membrane with air bubbles is a commonly used procedure and obvious to one of ordinary skill to maintain the surface of the membrane clean. Regarding applying gas pressure from both ends for backwash, it is well known that hollow fiber membranes often have both ends potted and have permeate collection headers on both ends. It is also well known that hollow fiber membranes are used with outside-in filtration, i.e., permeate in the lumen side (see the other references cited herein). In such designs, when the gas pressure is applied to the permeate side, pressurization would occur from both ends. JP teaches pressurizing the permeate side with gas at below bubble-point pressure.

JP also teaches (paragraph 0017) that when hollow fiber membranes are used, it is desirable to have feed stock solution in the lumen side – this means the JP reference anticipates appellant's claim 10.

KSR Int'l. v. Teleflex Inc., 127 S. Ct. 1727, 1732, 82 USPQ2d 1385, 1390 (2007): "it is commonsense that familiar items have obvious uses beyond their primary purposes, and a person of ordinary skill often will be able to fit the teachings of multiple patents together like pieces of a puzzle". "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results".

It would be obvious to one of ordinary skill in the art to combine the teachings of these references to arrive at the process recited in the claims because it would be obvious to use known process steps such as using compressed air to effect fluid flow to backwash the membrane, the backwash pressure being sufficient to make the liquid flow as taught by Smith, Sunaoka and/or Kopp in the process of filtering, scouring the membrane and draining as taught by Sunaoka or Cote; results of such steps being only predictable. For example, one would use the teachings of Smith for the backwashing steps in the teaching of Sunaoka because it is highly effective according to Smith (column 11, lines 1-3), and one would use the teaching of Sunaoka in the teaching of Smith to drain the tank and get rid of the accumulated waste especially in batch and semi-continuous operations.

Regarding the "inside-out" filtration as in claim 10, it is well known that hollow fibers can be used for both "outside-in" and "inside-out" operation, as is evidenced by **Bartels et al** (US 2003/0150807): paragraph 0039; or Smith C1, L18-23. Therefore, having the process recited for an "inside-out" filtration membrane would be obvious, compared to the "outside-in".

Additional details of the structure of the membrane system are well known in the art, and the references do teach such details. Suspending filtration and isolating the lumen of the hollow fiber and the header/manifold are implied if not explicit in the references, since providing a gas through the lumen of the hollow fibers for back flush require that the lumen and the manifold is fluidly connected to such gas source. Applying back flush requires stopping the filtration process, which is not inventive as argued.

The additional step of venting the gases remaining in the lumen is also implied, since such gas remaining in the lumen will be vented out through the filtrate flow when normal filtration is resumed. This is also not an inventive process step.

Applicant's arguments filed 11/12/09 and the declarations have been fully considered but they are not persuasive.

Declaration by Mr. Bruce Biltoft:

Mr. Biltoft's declares that MEMCOR (R) CP ultrafiltration systems are sold by Siemens Water Technologies Corp., and that these systems are commercially successful, and that these systems perform in accordance with the method recited in

claim 1. However, the Declarant has failed to link the commercial success of these systems to the claimed invention. Paragraphs 4-9 describe some marginal improvements (5% capital cost reduction, 1% improvement in operating efficiency and 20% reduction in backwash waste). These data do not provide any unexpected result. The Smith reference teaches various methods of quick and efficient backwashes, and such results only predictable from the teaching of the Smith. Subsequent paragraphs describe that 25% of Siemens Water Technologies' membrane market share and 50% of the hollow fiber membrane sales by Siemens uses the method of claim 1; and there is a 500% increase in sales in the past 4 years. However, the declarant provides no evidence that the sales increase is directly the result of the claimed invention. Thus the declaration fails to overcome the prima facie case.

Declaration of Dr. Zha:

Dr. Zha's declaration addresses the references individually by picking recited elements of the claims which are not explicitly stated in the references. He then goes on to state that he would not be motivated to modify the reference. The statements of Dr. Zha are only his opinions, and not objective evidence for overcoming the prima facie case of obviousness.

The claimed invention is applying a back-pressure with compressed air at a pressure lower than the bubble point of the membrane, such pressure being applied through both ends of the membranes and associated conduits and manifolds, and the backwash is conducted while scouring the external surface of the membrane with gas

bubbles. Scouring the membrane during backwash cycle is well known (Sunaoka, Cote, for example); backwashing with permeate driven using a gas at pressure below the bubble point is also well known (Kopp, Smith, JP reference); and applying backwashing through both ends of the hollow fibers is also known (see Cote). Combination of such well known elements is within the skill and commonsense of one of ordinary skill in the art and is not a patentable invention. More over additional reasons why one of ordinary skill in the art would considering modifying the individual references is also given in the rejection.

Moreover, the claimed invention in both claims 4 and 10 boils down to simply having a permeate backwash using a gas pressure as the driving force to flow the permeate water through the pores in the membrane walls. Backwashing membrane using permeate or filtered water is well known, and using gas pressure to do so is also well known, as is established in the rejection above. For one of ordinary skill, the gas pressure used as the driving force would be the pressure required to actually drive the water through the membrane pores, which obviously, can be below the bubble point of the membrane as is well established by evidence at least from Smith and JP references. And there are several reasons why compressed air would be used as the driving force instead of a pump, which would be such reasons as improved efficiency or uniformity (see JP, paragraph 0013 and 0014) and convenience.

The additional limitations of claim 1, such as scouring the membrane surface (well known and taught by several references cited herein), discharging the backwash waste from the tank (tank draining: well known and taught by several references cited

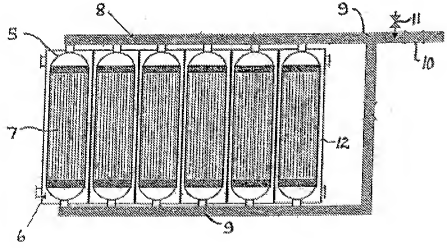
herein), refilling the tank with feed liquid (obviously it need be done to restart the process), and venting the gas from the lumen (obvious and inherent – will automatically vent when permeate fills in) are obvious process steps.

Analysis of obviousness may include recourse to logic, judgment and commonsense available to person of ordinary skill: Perfect Web Technologies, Inc. v InfoUSA, Inc. (Fed Cir, 2009-1105, 12/2/2009)

(10) Response to Argument

Claim Interpretation:

Figure 1 is the only figure depicting applicant's apparatus associated with the claimed process.



Claims 1 recites in part:

isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet when the filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid;

scouring surfaces of the membranes by flowing bubbles of a first gas past surfaces of the membranes;

supplying a second gas through a second gas inlet at a pressure less than a bubble point of the membranes;

In this recitation, there is a gas inlet that is isolated along with the lumen, the manifold and the portion of the piping, all upstream of the valve, after stopping the filtration process. There is also recited a second gas inlet to the isolated lumen, manifold and portion of the piping. This recitation makes it appear as if there are two separate gas inlets at the permeate (lumen) side of the membrane. However, the disclosure provides only one inlet - the valve 11 as seen in Fig. 1. Therefore, it was assumed that there is only one air inlet in the lumen side of the membrane for examination purpose. The 'gas inlet' that is isolated with the lumen, etc., and the 'second gas inlet' are considered as one and the same. Also, a step of actually isolating a gas inlet when the filtration is stopped is also not existent, because the gas inlet is isolated and not active during the filtration process for obvious reasons.

This same issue is present in independent claim 4 as well.

Independent Claim 4 is broader than claim 1, because claim 1 recites the details of the system including the vessel, etc., the additional process step of scouring the membrane surface by bubbles of a first gas, discharging the backwash waste from

the vessel (draining the tank), refilling the vessel with feed liquid, and venting the second gas from the lumen, etc.

Independent claim 10 is broader in scope than that of claim 4, and with the exception that the feed and the permeate side are reversed: claim 10 has feed in the lumen of the membrane and filtrate in the shell side.

Since appellant has not independently argued the claims, focus is being directed at the broader claim, claim 4.

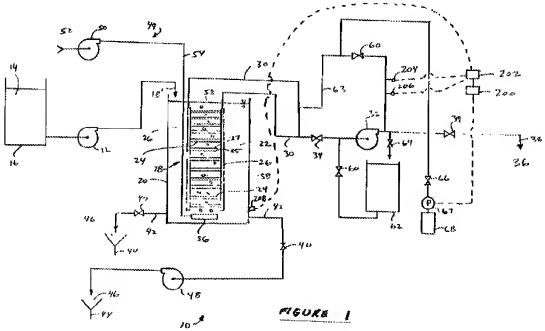
Claim 4 recites a filtration process in which a filtration membrane is immersed in the liquid suspension, and the liquid is being filtered through the lumen of the filter. An isolation valve is provided to isolate the filtration side of the membrane such as the lumen, the manifold and the connected piping. Since this limitation is open-ended, additional parts such as permeate storage reservoirs are not excluded from the *isolated part* in the claim, which is also clear from claim 11.

The process involves periodic stopping of the filtration process, isolate the lumen side of the membrane and then direct the permeate present in the isolated portion to pass through the pores of the membrane in the reverse direction to that of filtration (back-wash) using a gas pressure as a driving force, which gas pressure is below the bubble point of the membrane. Permeate is directed through both ends of the membrane.

Thus Claim 4 is a combination of (1) filtration through a filtration system having submerged membranes with filtrate in the lumen side and having an isolation valve, which filtration system has the capability to direct the permeate for back-wash through both ends of the filtration membrane, and (2) backwashing using gas pressure at below the membrane bubble point to drive the permeate through the membrane pores.

Applicant's one of the main *implied* arguments is that none of the references cited in the rejection teach the system required for the process of the claims (Sub heading 2, page 12, of the brief). This is not correct.

Such systems as required in the process of claims 1 and 4 are well known, and the teaching of **Cote** is a good example.



With respect to Fig 1 of Cote, the ladder-like structure is a schematic representation of a filtration membrane module. Each rung of the ladder (24) is a membrane. Each of the parallel vertical beams (rails) of the ladder are permeate

headers or manifolds (26). They are submerged in the water suspension in the tank (20). Scrubing air bubbles is provided by sparger (56) with associated piping and pump (50). The preferred filtration is from the shell side to the lumen side (see paragraph 0022). Permeate valve (34) can isolate the lumen, the manifolds (or headers) and the associated piping (30). There is a chemical injection inlet (63) connected to a chemical supply container and pump (68,67).

Backwashing is done through both ends of the membrane as is seen from the provisions in Fig. 1.

The **Cote** reference teaches back-washing using the permeate alone – see paragraph 0025. These are short backwashes lasting from 15 seconds to one minute and repeated periodically in about 15 minutes to 90 minute intervals. The backwashing fluid is driven by a pump in Cote, and Cote does not teach using a gas pressure at below the bubble point for making the permeate flow through the membrane. However, using air pressure in place of such a pump is well known in the art, and one would use air pressure in place of pump as a design convenience and also to eliminate a pump for that purpose. Using gas as a driving force in place of a liquid pump is also taught as providing improvements by the JP reference as explained elsewhere herein. And JP provides the necessary design details for providing such provision (Fig. 2). When applying an air pressure for this purpose, one of ordinary skill in the art would consider the appropriate pressure required to make the permeate flow through the pores without raising the potential for damage to the membrane, for which an appropriate pressure would be below the bubble point of the membrane, which can be gleaned from the

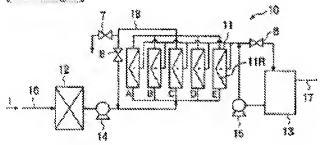
teaching of the JP reference, Smith or Kopp. In any case, an air pressure above the bubble point of the membrane may not be needed to simply make the permeate flow back through the pores of the membrane, if the need is only to make the permeate water flow back, which is the case with Cote. Alternately, one of ordinary skill in the art would consider the teaching of JP when choosing the air pressure to prevent the membrane from damage.

Any argument that the process of claim 4 is limited to whatever permeate that is remaining in the lumen and the headers and the piping also would not be persuasive because, first of all, the volume of permeate contemplated in the 15-second washing cycles of Cote is very low. Secondly, applicant's claims do not have any criticality for this volume, and this volume is also very subjective depending on the sizes of the lumen, the manifolds and the piping. In addition, appellant's claim 11 which dependent from claim 4 recites providing an additional tank of permeate if the volume of permeate available is insufficient, which is further evidence of lack of criticality..

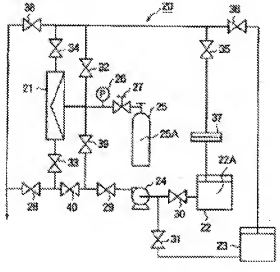
The **JP** reference teaches backwashing a hollow fiber filtration membrane (paragraph 0007-00013 and figures 1 and 2) submerged in suspended water periodically in between normal operations. Backwashing is done by pushing with gas below the bubble point. Particularly, the reference teaches not to use the air pressure above the bubble point because it may be detrimental to the membrane. Pushing the permeate out of the lumen of the membrane is carried out by air at below the bubble point prior to a chemical cleaning using cleaning solutions such as hypochlorite, and

then cleaning solution is slow flushed out using air at below bubble point – see paragraph 0012. Gas does not flow through the pores – see paragraph 0013.

[Drawing 1]



[Drawing 2]



JP does not specifically teach back-washing through both ends of the membrane. However, this is not a patentable feature over this reference, because backwashing through both ends of the membrane is well known as is seen in the Cote and Kopp references. Also, one of ordinary skill in the art would in fact use the teaching of this reference to modify the process taught by Cote because JP teaches that by their method cleans the membrane in a shorter time with better cleaning and lower cost - see paragraph 0004.

While the JP reference does teach additional cleaning steps such as the chemical cleaning after pushing the permeate water out of the lumen and through the pores of the membrane in the reverse flow, such additional cleaning steps do not disqualify the reference because appellant's claims are open-ended.

Smith teaches cleaning hollow fiber membranes by back-pulsing with low pressure fluids in the lumen, wherein the cleaning agent can be a gas. Specifically, Smith teaches using "no more than the bubble point". See column 11, lines 20-41. The pressure suggested for microfiltration is preferably 0.5 psi. Smith teaches that this type of short-term cleaning steps is highly effective. This cleaning fluid can be the permeate itself. In any case, isolating the permeate side and then injecting the gas would inherently push permeate filled in the lumen back through the pores. Smith teaches permeate as the back-flush fluid in fig 4.

Kopp teaches using air in the lumen of the hollow fibers at below the bubble point to flush water from the lumen and then above the bubble point to have effective air back-flush, while agitating the membrane. Kopp, C3, L27 – C4, L50. Kopp also teaches delaying the onset of filtration process until the expanded membrane is relaxed to its normal condition after the back wash with air bubbles through the lumen to prevent quicker plugging of the expanded fiber pores as they relax (column 11, lines 62-67).

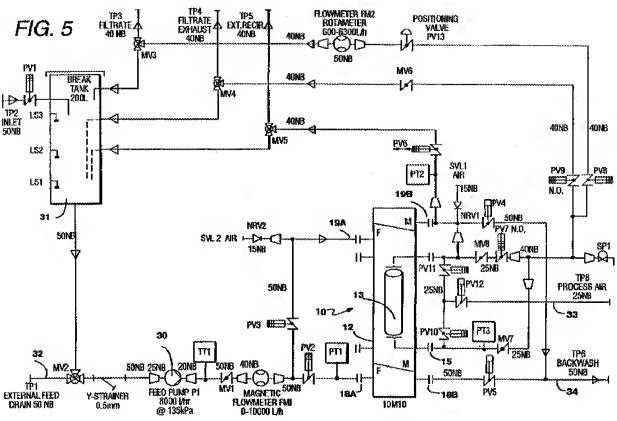


Fig 5 of Kopp: the apparatus of Kopp is capable of back-flushing from both ends of the membrane (13).

The Sunaoka reference provides evidence that the tank draining the refilling steps are well known in the art.

Claim 1 recites, additionally, the process steps of scouring the membrane surface, draining the tank and venting the air from the membrane lumen. Of these, scouring the membrane surface with air bubbles is commonly used in submerged membrane filtrations and is taught by al but the JP reference. Discharging the cleaning waste is also taught by Sunaoka as well as Kopp. Venting the air out of the lumen is

implied when the filtration process is restarted, because the gas will vent as the lumen and the manifolds fill with permeate water.

Regarding the other arguments:

1. **One of ordinary skill in the art would not have been motivated to have combined Smith and/or Sunaoka and/or Kopp and/or Cote and/or JP '769 in the manner asserted.**

    i. **The asserted motivations for combining the cited references are facially invalid.**

The arguments presented in this section are by taking portions of the rejection explaining reasons to combine and then making an argument that there is no reason why the benefits of the method step of one reference would be useful in the teaching of another.

The appellant makes an attempt to show that Zha's declaration demonstrates objective evidence that one of ordinary skill in the art would not be motivated to combine the references as asserted by the Examiner.

Regarding the specific argument, no motivation to combine (page 5 and second paragraph on page 6): Applicant cites Examiner's statements at random and in piece meal, without giving any objective consideration to the context in which the reasons were provided, to make this argument that there is no reason to combine. The Examiner believes that claims 4 and 10 boils down to a very well known process step of backwashing the membrane using permeated water with backwashing driving force provided by compressed air. The gas pressure supplied is the pressure required to make water flow through the membrane, which is obviously less than the bubble point of

the membrane. Moreover, there is teaching in the prior arts that gas pressures above this could be detrimental to the membrane. The additional limitations in claim 1 are also shown as well known and obvious. Thus there is provided overwhelming reasons why the claims are obvious over the cited prior arts. Also a number of prior arts were cited which teach variations of the main principles, which further adds to the preponderance of evidence of obviousness. In addition, the dependent claims add other well known process steps which also prompted inclusion of additional references than just one or two.

Another argument presented is hind-sight reasoning (first paragraph, page 7) and bodily incorporation (second paragraph of page 7): the argument that examiner is using impermissible hind-sight has no merit. The reasons to combine have been presented which came from the references themselves, and not taken from applicant's disclosure. The argument that Smith and Sunaoka operate in completely different ways, and therefore, cannot be combined is also meritless. Smith teaches improvements in the hollow membrane cleaning process, which are useful in general water filtrations systems such as ultrafiltration. Sunaoka teaches cleaning porous hollow fiber membranes used in industrial and other wastewater treatment. Bio-films and iron oxides are common in natural and wastewaters. Thus this argument has no merit.

ii. **Objective evidence provided in the Zha Declaration demonstrates that one of ordinary skill in the art would not have been motivated to have made the combinations of references asserted by the Examiner.**

In presenting the arguments as to why one of ordinary skill in the art would not have been motivated to combine the references as asserted by the Examiner, Dr. Zha considers a lot more limitations than what is claimed in the claims. Then Dr. Zha ignores many of the teachings of the references.

For example, take the case of the Cote reference (paragraph (23) of the declaration. Contrary to what is argued by Dr. Zha, Cote teaches isolating the lumen, the manifold, and portions of the piping after the filtration process is stopped, as shown with the help of Cote's Fig 1 above.

Arguments presented by Dr. Zha assumes bodily incorporation of the references on one-another. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Argument that the combinations would render the apparatus incapable of performing intended purposes (page 9, top) and teaching away (page 9, 1st paragraph): Again these arguments have no merit, because no objective reasoning is provided as to why these apparatuses would have become incapable or inoperable and therefore, teach away.

While several of these systems taught by the references could be easily modified to afford the improved process steps taught by several other cited references, the

principle in the determination of non-patentability of the claims is based on what one of ordinary skill can glean from the teachings of these references to have a process of operation of a membrane system to purify natural or wastewater. One of ordinary skill in the art could easily glean from these references that the membrane can be operated with inside-out (claim 10) or outside-in filtration (claims 4 and 1), and that the membranes can be kept clean by scouring the external surface of the membranes using gas bubbles, and that the membranes can be periodically cleaned by backwashing using permeate to improve filtration rate, such cleaning step can be conducted by using compressed air as the driving force for the permeate water at pressures below the bubble point, the pressure required would be less than the bubble point to push water through the membrane pores, and that higher pressures could be detrimental to the membrane, and that one may drain the tank after cleaning to remove the backwashed waste, in which case refilling the tank is necessary to start filtration, and that the gas in the lumen (or shell) of the membranes would be automatically vented when permeate fills in the space as filtration proceeds, if not vented before.

2. **Even if the asserted combination of references were valid, the combination still fails to teach each and every element of the present claims.**

Argument that all the elements of the claims still will not be found in the asserted combination of references is not correct. The example cited are:

(1)

isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet when the filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid;

This is present in most of the references, see for example, Kopp (Fig 5) and Cote (fig 1). More over, this is an engineering detail required for the filtration process plant and within the capability of one of ordinary skill in the art, and is not an inventive idea.

(2): Venting the gases from the lumen, etc., is not a patentable limitation either, because when the filtration process is restarted after using the gas to back-wash, the filtrate filling in the lumen will vent the gas form it, and such is implied.

3. **Secondary indicia of non-obviousness illustrate that the claimed subject matter is non-obvious.**

The Biltoft declaration was given due consideration. It fails to address how the commercial success is linked to the elements of the claims.

First of all, this declaration cannot claim the alleged commercial success on claim 10, because claim 10 recites a process which is different from that of claim 1 and 4, that is, the filtrate is taken out from the shell side.

Secondly, this declaration would not overcome the rejection of the broader claim 4, because the declarant specifically states the success of the operation of the systems as according to claim 1.

Eliminating the backwash pump and the permeate holding tank reduces the capital cost by 5%, and increase operating efficiency by 1%: there is no link that this had caused the alleged commercial success. Moreover, at least the JP reference teaches that the process would reduce cost, and time of operation. Cote teaches effectiveness of the 15-second backwash cycles with permeate as well, which would reduce the wastage, as well as time.

Backwashing through both ends reduces waste: again, this is known in the art and taught at least by Cote.

The subsequent statement that the market share increase by 25% and sales increase by 500% and systems operated by the method of claim 1 now account for 50% of all sales of hollow fiber membrane systems, are due to these advantages is not connected by any evidence to the elements of the claims. Commercial success must be derived from the claimed invention (MPEP 716.03). Particularly, there is no nexus shown between the alleged commercial success and the claimed invention. The declaration only states that the filtration system which operates according to the claimed process had the alleged success.

The alleged increase in efficiency, reduced waste and reduced capital and operating costs also cannot be considered as "unexpected", because such would be expected when the number of parts are reduced in a process system. And such improvements can be gleaned from the teachings of these references by one of ordinary skill, and are therefore, expected. In this Examiner's opinion, they are not improvements; they are simply reverting to the older known method steps.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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